PRELIMINARY
INSTRUCTION MANUAL

MODEL 183
5 MHz XCG / SWEEP GENERATOR

WAVETEK

9045 BALBOA AVENUE, SAN DIEGO, CALIFORNIA

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INSTRUCTION MANUAL

MODEL 183
5 MHz XCG / SWEEP GENERATOR

WAVETEK
Box 651, San Diego, Calif., 714-279-2200

PR-3/75

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CONTENTS

SECTION 1 GENERAL DESCRIPTION

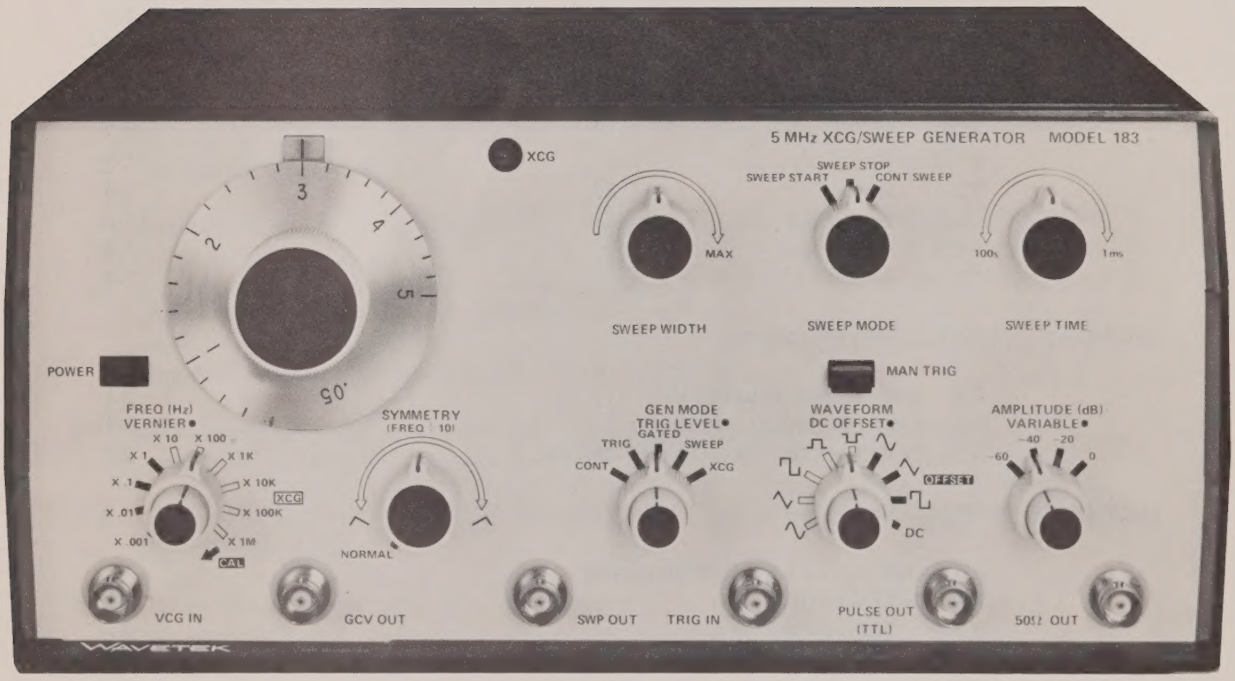
1.1 THE MODEL 183 1-1
1.2 SPECIFICATIONS 1-1
1.2.1 Versatility 1-1
1.2.2 Operational Modes 1-2
1.2.3 Voltage Controlled Generator 1-2
1.2.4 Triggered Generator 1-2
1.2.5 Horizontal Precision 1-2
1.2.6 Vertical Precision 1-3
1.2.7 Purity 1-3
1.2.8 Environmental 1-3
1.2.9 Mechanical 1-3
1.2.10 Power 1-3

SECTION 2 INITIAL PREPARATION

2.1 UNPACKING INSPECTION 2-1
2.2 PREPARATION FOR USE 2-1
2.3 ELECTRICAL ACCEPTANCE CHECK 2-1

SECTION 3 OPERATING

3.1 CONTROLS AND CONNECTORS 3-1
3.2 OPERATION 3-5
3.2.1 Signal Termination 3-5
3.2.2 Continuous Operation 3-5
3.2.3 Trigger Mode 3-6
3.2.4 Triggering 3-6
3.2.5 GATED (or Tone Burst) Mode 3-6
3.2.6 SWEEP Mode 3-6
3.2.7 XCG Mode 3-7
3.2.8 Voltage Control – VCG 3-7


5 MHz XCG/SWEEP GENERATOR MODEL 183
XCG
SWEEP STOP
SWEEP START
CONT SWEEP
MAX
100s
1ms
SWEEP WIDTH
SWEEP MODE
SWEEP TIME
POWER
MAN TRIG
FREQ (Hz)
VERNIER
X 10
X 100
X 1
X 1K
X .1
X 10K
XCG
X .01
X 100K
X .001
X 1M
CAL
SYMMETRY
(FREQ : 10)
NORMAL
GEN MODE
TRIG LEVEL
GATED
TRIG
SWEEP
CONT
XCG
WAVEFORM
DC OFFSET
OFFSET
DC
AMPLITUDE (dB)
VARIABLE
-40
-20
-60
0
VCG IN
GCV OUT
SWP OUT
TRIG IN
PULSE OUT
(TTL)
50Ω OUT
WAVETEK

SECTION 1
GENERAL DESCRIPTION

1.1 THE MODEL 183

Wavetek Model 183, the 5 MHz XCG/Sweep Generator, is a precision source of sine, triangle, square, positive pulse and negative pulse waveforms plus dc voltage. Frequency of the waveforms is manually and remotely variable from 100 μHz to 5 MHz. Select frequencies from 2 Hz to 5 MHz can be locked to a crystal oscillator for maximum frequency accuracy.

The generator can repetitively sweep between two individually set frequencies and at a particular sweep rate. The amplitude of waveforms is continuously variable from 20V p-p, open circuit maximum, to −80 dB.

Center reference of the waveforms can be offset positively and negatively.

The symmetry of the waveforms is continuously adjustable from approximately 1:19 to 19:1. Varying symmetry provides variable duty cycle pulses, sawtooth and asymmetrical sine waveforms.

A dc voltage representing generator frequency, a fixed-amplitude pulse train of that frequency, and a voltage ramp representing frequency sweep rate are provided as front panel outputs.

1.2 SPECIFICATIONS

Specifications (waveform, frequency, and amplitude selection), operating modes, precision (accuracy), and waveform purity (quality) are listed in the following paragraphs.

1.2.1 Versatility

Waveforms
Five selectable waveforms, sine ∿ , triangle △ , square ⊓ , positive pulse ⎍ , negative pulse ⎎ , plus variable DC output. Symmetry of all waveform outputs is continuously adjustable from approximately 1:19 to 19:1. Varying symmetry provides variable duty cycle pulses, sawtooth, or asymmetrical sine waveforms. Separate sync output is included.

Control
Frequency can be controlled manually, with external voltage (VCG) or with internally generated ramp voltage. XCG (Crystal Controlled Generator), when selected, crystal locks on every frequency corresponding to the calibration marks on the dial.

Operating Frequency Range
Frequency selectable from 0.0001 Hz to 5 MHz in the following linear ranges:

X 0.001	0.0001 Hz to 0.005 Hz
X 0.01	0.001 Hz to 0.05 Hz
X 0.1	0.005 Hz to 0.5 Hz
X 1	0.05 Hz to 5 Hz
X 10	0.5 Hz to 50 Hz
X 100	0.5 Hz to 500 Hz
X 1K	5 Hz to 5 kHz
X 10K	50 Hz to 50 kHz
X 100K	500 Hz to 500 kHz
X 1M	5 kHz to 5 MHz

NOTE

When SYMMETRY control is used, the output frequency is different from the dial indicated frequency. The maximum symmetry ratio obtainable is also dependent on the frequency dial setting. Symmetry must be normal for XCG operation.

There are 25 XCG frequencies in each of the X 10 thru X 1M ranges.

Main Output
∿ , △ , ⊓ ; variable to 20V p-p into open circuit and 10V p-p into 50Ω load. DC offset of waveform (or DC if selected) is adjustable to ±10 volts open circuit and ±5 volts into 50Ω load.

⎍ , ⎎ , DC: 0 to +10 or −10 volts into open circuit and 0 to +5 or −5 volts into 50Ω load.

Output dc voltage is limited to approximately ±10 volt open circuit and output current is limited to approximately 130 mA.

Output can be attenuated from 0 dB to −80 dB: −60 dB in 20 dB steps, plus a 20 dB vernier for continuous variation (20 dB vernier does not affect offset or DC).

Source Impedance: 50Ω.

Pulse Output
Output voltage is TTL compatible. Rise and fall times are typically 15 ns. Sync is normally a symmetrical square waveform; with SYMMETRY control ON, it is rectangular.

Sweep Output
SWEEP OUT connector provides an open circuit 0 to +5 volt (approximately) ramp from a 600Ω impedance source.

DC Offset
DC offset of ∿ , ∿ , or ⊓ waveform, or DC if selected, is adjustable to ±10 volts open circuit and ±5 volts into a 50Ω load. Output current is limited to approximately 130 mA. Waveform + offset is limited to ±10V into an open circuit.

GCV Output
A dc voltage proportional to the instantaneous frequency of the generator output. 0 to +5V, open circuit, 1 kΩ source impedance.

1.2.2 Operational Modes

Continuous
XCG Off: Operating as a standard VCG (voltage controlled generator), frequency output is determined by front panel control settings in conjunction with external control voltage at VCG IN.

XCG On: Operates as a standard VCG, except output of main generator determined by dial and VCG input voltage is in 25 harmonic-related frequencies with crystal accuracy on X 10 range and above. Crystal lock indicated by lighted XCG lamp. Lock occurs at every mark on dial (from 0.2 to 5 in 0.2 increments) and for the equivalent VCG voltages plus dial.

Triggered
Only one complete cycle of output appears at 50Ω OUT connector for each pulse applied to TRIG IN connector (or press of MAN TRIG switch).

Gated
Same as triggered mode except that output oscillations continue for duration of gating signal applied to TRIG IN connector (or as the MAN TRIG switch is depressed).

Sweep
XCG Off: The internal ramp generator can sweep the main generator up in frequency with a linear ramp.

XCG On: This mode is not recommended. However, discrete frequency stepping does occur for XCG frequencies within the sweep range, provided the sweep time between each frequency does not exceed the locking time of the XCG circuit.

Sweep Time: The time for each sweep ramp can be varied from 100s to 1 ms.

XCG
XCG switch on places instrument in XCG mode. When dial rotated to a calibration mark, XCG lamp lights; generator is locked to crystal. There are 25 XCG frequencies in each of 6 ranges (XCG frequency ranges from 2 Hz to 5 MHz). XCG frequencies available with VCG voltages as well as dial.

1.2.3 Voltage Controlled Generator

VCG Control Range: Up to 1000:1 frequency change with external voltage input.

Input Impedance: 5 kΩ.

VCG Voltage: 0 to 5V.

VCG Slew Rate: 2% of range per μs.

VCG Linearity: ±0.5% from 0.0001 Hz to 50 kHz.

1.2.4 Triggered Generator

Trigger pulse is 1V p-p to ±10V; input impedance is 10 kΩ, 33 pF; minimum pulse width is 50 ns; maximum repetition rate is 5 MHz.

1.2.5 Horizontal Precision

Dial Accuracy (Symmetrical Waveform) Freq Acc
XCG Off: 0.005 Hz to 5 MHz ±2% of full scale
0.0005 Hz to 0.005 Hz ±4% of reading and ±2% of full scale

XCG On: ±0.01% of XCG setting (when XCG lamp is on). (X 10 range accuracy must be measured over a 10s period.)

Frequency Vernier
Approximately 1% of range. Vernier affects calibration of frequency dial.

Time Symmetry
0.005 to 500 kHz . . . . . ±1%

XCG Locking Time
X 1K thru X 1M . . . . . Less than 500 ms
X 100 . . . . . Less than 5s
X 10 . . . . . Less than 50s

1.2.6 Vertical Precision

Amplitude Change With Frequency (Sine)
Less than 0.1 dB to 100 kHz.
Less than 0.2 dB to 1 MHz.
Less than 1 dB to 5 MHz.

Step Attenuator Accuracy
±0.3 dB per 20 dB step.

Stability
Short Term . . . . . ±0.05% for 10 minutes
Long Term . . . . . ±0.25% for 24 hours

Percentages apply to amplitude, dc offset and main generator frequency in the linear mode.

Amplitude Symmetry
±1% of amplitude range to 1 MHz for all symmetrical waveforms.

1.2.7 Purity

Sine Distortion
10 Hz to 100 kHz . . . . . Less than 0.5%
0.005 to 1 MHz . . . . . Less than 1%
1 MHz to 5 MHz . . . All harmonics at least 30 dB down

Triangle Linearity
0.0005 Hz to 100 kHz . . . . . Greater than 99%

Square Wave Rise and Fall Time
Less than 25 ns terminated into 50Ω load.

Square Wave Total Aberrations
Less than 5%.

1.2.8 Environmental

All specifications listed are for 25°C ±5°C. For operation from 0°C to 55°C, specifications including horizontal precision, amplitude symmetry, and sine wave distortion are derated by a factor of 2.

1.2.9 Mechanical

Dimensions
11¼ in./28.6 cm wide; 5¾ in./14.5 cm high; 10¾ in./27.3 cm deep.

Weight
8.5 lb/3.8 kg net; 12 lb/5.5 shipping.

1.2.10 Power

90V to 110V, 105V to 125V, 180V to 220V or 210V to 250V; 50 Hz to 400 Hz; less than 25 watts.

NOTE

Specifications apply from 10 to 100% of a selected frequency range with SYMMETRY control OFF.

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SECTION 2
INITIAL PREPARATION

2.1 UNPACKING INSPECTION

After carefully unpacking the instrument, inspect the external parts for damage to knobs, dials, indicators, surface areas, etc. If there is damage, file a claim with the carrier who transported the instrument. Retain the shipping container and packing material for use in case reshipment is required.

2.2 PREPARATION FOR USE

Before connecting the instrument to line power, be sure the rear panel 115/230V and HI/LO switches are set to the value nearest the line voltage and that the fuse is correct for the switch setting. Be sure that the plug on the power cord is the proper mate for the line receptacle.

AC Line Voltage	Switch A	Switch B	Fuse (SB)
90 - 110	115	LO	½ amp
105 - 125	115	HI	½ amp
180 - 220	230	LO	¼ amp
210 - 250	230	HI	¼ amp

2.3 ELECTRICAL ACCEPTANCE CHECK

This checkout procedure verifies the generator operation. If a malfunction is found, refer to the Warranty in the front of this manual. An oscilloscope, frequency counter and 50Ω feedthru are needed for this procedure (figure 2-1).

Preset the generator front panel controls as follows:

Control	Position
GEN MODE	CONT
WAVEFORM	∿
SYMMETRY	NORMAL
FREQ Range	X 10
FREQ VERNIER	CAL
Frequency Dial	1
AMPLITUDE	0 dB
AMPLITUDE VARIABLE	Full clockwise
DC OFFSET	12 o'clock
TRIG LEVEL	Full counterclockwise
SWEEP MODE	CONT SWEEP
SWEEP WIDTH	MAX
SWEEP TIME	12 o'clock

Perform the steps in table 2-1. Where tolerances are not given, only approximated values are required to verify operation.

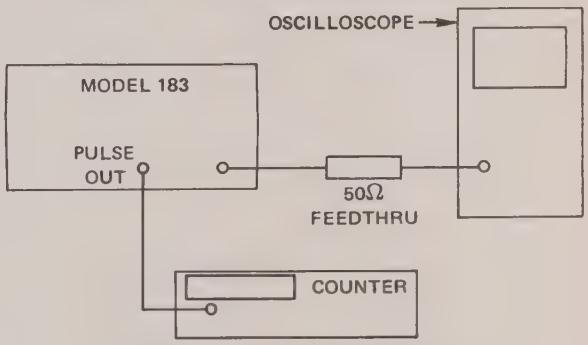


Figure 2-1. Acceptance Test Setup

Table 2-1. Performance Checkout

Step	Control	Position/Operation	Observe at 50Ω OUT
	Function		
1	POWER	Push on	Sine wave, 10 Hz, 10V p-p
2	WAVEFORM	∿	Triangle wave
3	WAVEFORM	⊓	Square wave
4	WAVEFORM	⎍	Positive pulse

Table 2-1. Performance Checkout (Continued)

Step	Control	Position/Operation	Observe at 50Ω OUT
5	WAVEFORM	⊔	Negative pulse
6	SYMMETRY	CW	Frequency ÷ 10, decreasing negative pulse width
7	SYMMETRY	CCW	Decreasing positive pulse width
8	SYMMETRY	NORMAL	– – –
9	WAVEFORM	∿ (OFFSET)	Sine wave, 1 kHz, 10V p-p
	Frequency		
10	GEN MODE	XCG	10 ±0.001 Hz (XCG lamp lighted)
11	FREQ Range	X 100, · · · · X 1M	Frequency increases by a decade for every change of switch position. Respective tolerances are: ±0.01 Hz, ±0.1 Hz, ±1 Hz, ±10 Hz, and ±100 Hz.
12	GEN MODE	CONT	1 MHz
13	FREQ Range	X 1	1 Hz
14	FREQ Range	X .1, · · · · X .001	Detect generator running
15	FREQ Range	X 1K	– – –
16	FREQ VERNIER	CCW	Frequency decreases 1%
17	FREQ VERNIER	CAL	– – –
18	Frequency Dial	5	Frequency = 5 kHz
19	Frequency Dial	.05	Frequency = 50 Hz
20	Frequency Dial	1	– – –
	Amplitude		
21	AMPLITUDE Range	–60 dB	10 mV p-p
22	AMPLITUDE VARIABLE	CCW	1 mV p-p
23	AMPLITUDE Range	0	1V p-p
24	DC OFFSET	CW	Positive slew; about +5V positive peak
25	DC OFFSET	CCW	Negative slew; about –5V negative peak
26	DC OFFSET	Center	– – –

Table 2-1. Performance Checkout (Continued)

Step	Control	Position/Operation	Observe at 50Ω OUT
	Trigger & Gate		
27	GEN MODE	TRIG	0 Vdc
28	MAN TRIG	Push	Generate one cycle
29	GEN MODE	GATED	0 Vdc
30	MAN TRIG	Push and hold	Waveform gated on
31	MAN TRIG	Release	0 Vdc
	Sweep		
32	GEN MODE	SWEEP	Frequency sweeps
33	SWEEP TIME	CW	Sweep rate increases
34	SWEEP TIME	CCW	Sweep rate decreases

SECTION 3
OPERATING

3.1 CONTROLS AND CONNECTORS

The generator front panel controls and connectors are shown in figure 3-1 and keyed to the following descriptions:

1 POWER Switch

Power is turned on and off with the POWER push-button. The frequency dial index **1A** lights when power is turned on.

2 Frequency Dial

Frequency settings of the dial multiplied by frequency range **19** determine output frequency. In frequency sweep operation, this dial determines the frequency from which sweep is started.

3 XCG Lamp

The XCG lamp indicates that the selected frequency is locked or locking to the crystal circuit.

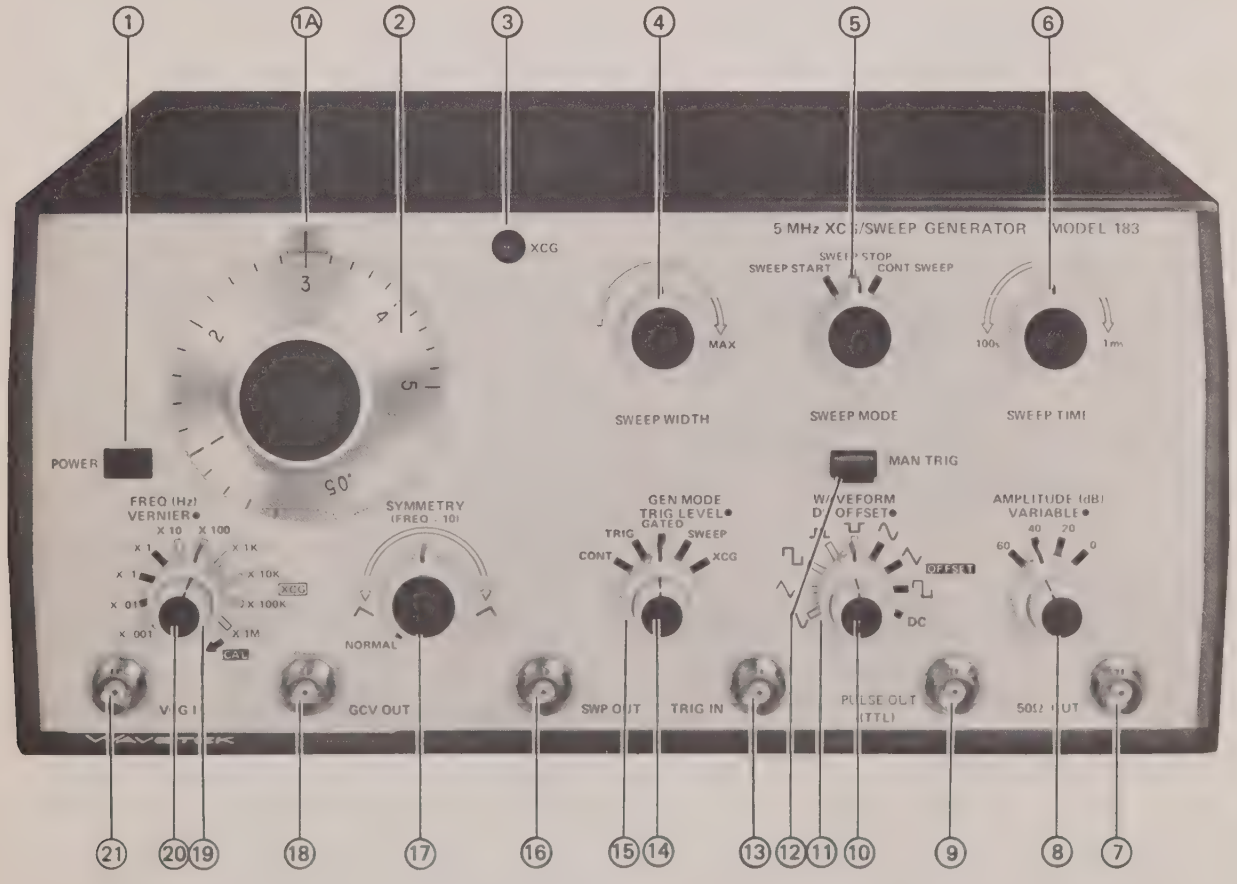


Figure 3-1. Front Panel Controls and Connectors

4 SWEEP WIDTH Control

Setting the SWEEP WIDTH control determines the sweep stop frequency (see figure 3-2). SWEEP WIDTH at MAX gives sweeps to the top of the range, which is 5 times the setting of the FREQ switch. See SWEEP MODE selector **5** .

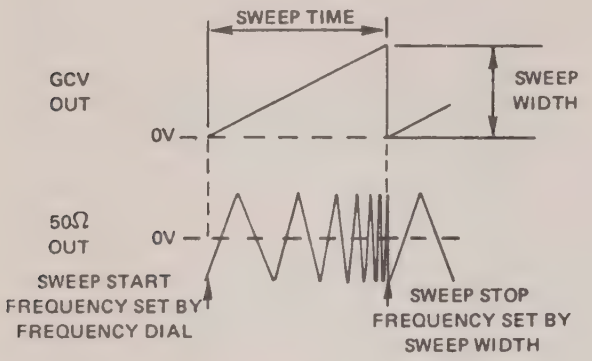


Figure 3-2. Effect of Sweep Time and Width on Output Frequency

5 SWEEP MODE Selector

The SWEEP MODE selector is enabled by the GEN MODE selector **15** set to SWEEP. An internally-generated voltage ramp becomes an internal VCG input. The start frequency of the generator is determined by the frequency dial **2** and the stop frequency is determined by the SWEEP WIDTH control **4** . The SWEEP START and SWEEP STOP settings will hold the output signal at the start and stop frequencies, respectively, while the frequency dial **2** and SWEEP WIDTH control **4** are adjusted. CONT SWEEP allows frequency sweeping to occur.

6 SWEEP TIME Control

Frequency of the internal sweep ramp, and thus, the sweep repetition rate, is governed by the SWEEP TIME control (see figure 3-2).

7 Main Output Connector

Maximum output of 10V p-p signals into a 50Ω load (20V p-p open circuit) is provided at the 50Ω OUT connector; all generator mode signals are delivered at this connector. See **8** for amplitude of output.

8 AMPLITUDE Control

The AMPLITUDE switch affects waveforms, dc output and waveform dc offset. The VARIABLE control affects waveforms only. Maximum waveform amplitude is with the 0 dB setting of the AMPLITUDE control and with the VARIABLE control fully CW (see the following table). Amplitude is decreased 20 dB with VARIABLE control fully CCW.

Function	Maximum Voltage at 0 dB	
	Open Circuit	50Ω Termination
∿ , ∿ , ⊓	20V p-p	10V p-p
⎍	0 to +10V	0 to +5V
⎎	0 to −10V	0 to −5V
DC	±10V	±5V

9 Synchronizing Pulse Output Connector

A fixed amplitude (0 to about 5V) TTL compatible square wave of the generator frequency is provided at the PULSE OUT connector. This output can be used as a synchronizing reference for the main output **7** . Phase of the waveforms relative to the sync output is shown in figure 3-3.

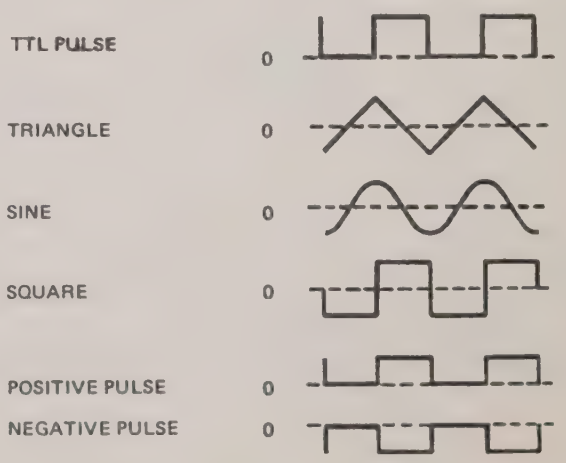


Figure 3-3. Pulse/Waveform Phase Relationship and Waveform Reference Lines

10 DC OFFSET Control

Offset of waveforms and dc voltage are controlled by the DC OFFSET control. The WAVEFORM switch **11** must be in one of the four right-hand settings. Center of the waveform reference (figure 3-3) is skewed positive with clockwise rotation, negative with counterclockwise rotation. Offset and dc voltage maximums are ±5V (50Ω terminated).

11 WAVEFORM Selector

Sine ∿ , triangle △ , and square ⊓ waveforms, and positive and negative square pulse trains ⎍ , ⎎ are selected for output by the WAVEFORM selector, with or without dc offset. When set for dc offset, the inner knob **10** controls the ±5V (50Ω terminated) offset. DC is selected for dc output with voltage controlled by the inner knob **10** .

12 Manual Trigger Control

In TRIG mode **15** , the MAN TRIG pushbutton is used to trigger a single cycle of waveform output and, in the GATED mode, to gate the output of waveforms until released.

NOTE

The TRIG LEVEL control **14** *must be fully CCW.*

13 Remote Trigger Input Connector

The TRIG IN connector accepts voltage level inputs that trigger and gate the generator in TRIG and GATED modes **15** , respectively. The trigger level control **14** determines the level at which the TRIG IN input is accepted for triggering or gating. A positive-going excursion through a voltage level, which can be set in the range of −7.5V to +7.5V by the TRIG LEVEL control triggers or gates the generator operation.

A negative-going dc excursion through the trigger level ends gated operation. Figure 3-4 shows triggering and gating of the generator waveforms at time t1. Once triggered or gated, a full cycle of the selected waveform is output to its completion: when gating is removed at time t2, for example, the last full cycle of waveform completes itself at time t3.

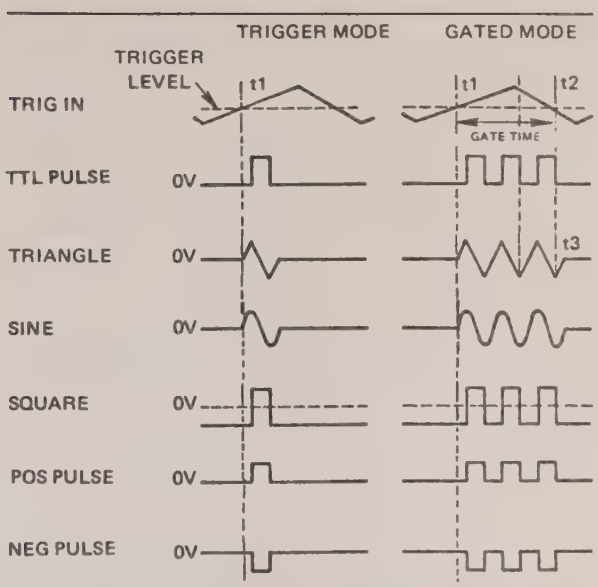


Figure 3-4. Generator Trigger and Gated Control

14 Trigger Level Control

The TRIG LEVEL control determines the level at which the input at the TRIG IN connector **13** is accepted as a trigger in the generator trigger and gated modes **15** . The trigger level can be varied from fully clockwise, where a positive-going excursion thru −7.5V is a trigger, to fully counterclockwise, where a positive-going excursion thru +7.5V is a trigger.

15 Generator Mode Selector

Generator modes are:

1. Continuous — An uninterrupted output of the selected waveform at the selected frequency and amplitude.

2. Triggered — One cycle of the selected waveform at the selected frequency and amplitude when the trigger signal is detected at TRIG IN **13** or when manually triggered at **12** .

3. Gated — A burst of the selected waveform at the selected frequency and amplitude, which starts when the gate signal is detected at TRIG IN **13** and lasts through the completion of the last cycle started before the removal of the gate signal, or starts and stops when manually gated at **12** .

4. Automatically Swept Frequency — Sweep as determined by the SWEEP MODE control **5** .

5. Crystal Controlled Generator — XCG frequencies, which are associated with each dial mark, are locked to a crystal oscillator. Lock is indicated by the XCG lamp **3** on.

16 Sweep Ramp Output Connector

The internal sweep generator ramp is available at the SWP OUT connector. Ramp frequency is varied by the SWEEP TIME control. Output is a 0 to +5V ramp, 600Ω source impedance.

17 Waveform SYMMETRY Control

Normal symmetrical output results when SYMMETRY is set to NORMAL; an asymmetrical, or unbalanced, waveform results when SYMMETRY is set between ◺ and ◿ . (Asymmetric operation reduces generator frequency to approximately 1/10th the normal output.) Figure 3-5 shows the effect of SYMMETRY control on the waveforms.

NOTE

When SYMMETRY control is used, the output frequency is different from the dial indicated frequency. The maximum symmetry ratio obtainable also depends on the frequency dial setting. A typical example is shown in table 3-1.

18 GCV Output Connector

GCV OUT provides dc excursions of 0 to about +5V which represent the output frequency in the selected range. Source impedance is 1 kΩ.

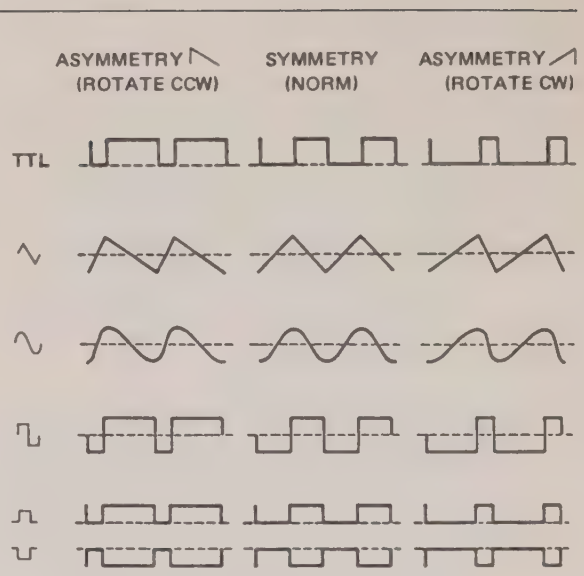


Figure 3-5. Effect of SYMMETRY Control

19 Frequency Range Control

The selected range settings of the FREQ selector, multiplied with the frequency dial **2** setting determine output frequency.

20 Frequency VERNIER Control

The frequency is as labeled on **19** and **2** , when the VERNIER control is set fully clockwise to CAL (calibrated). Rotating the VERNIER control counterclockwise decreases output frequency. The range is approximately 1% of the selected frequency range.

Table 3-1. Linear Dial Setting

Frequency Range	X 100K					
Dial Setting	5	4	3	2	1	0.5
Indicated Frequency	500 kHz	400 kHz	300 kHz	200 kHz	100 kHz	50 kHz
Output Frequency	54 kHz	44 kHz	33 kHz	23 kHz	12 kHz	6.5 kHz
Maximum Symmetry Ratio	18:1	18:1	18:1	17:1	16:1	15:1

21 VCG Input Connector

DC voltage excursions of 0 to ±5 volts at the VCG IN connector control frequency within the selected range. Positive inputs increase frequencies set by the frequency dial **2** and range control **19**, and negative inputs decrease the frequencies. Input impedance is 10 kΩ. Frequency excursions of 1000:1 are possible.

3.2 OPERATION

Operation is discussed in terms of the five generator modes: continuous, triggered, gated, sweep and XCG (crystal controlled) plus VCG (voltage controlled).

3.2.1 Signal Termination

Proper signal termination, or loading, of the generator connectors is necessary for its specified operation. For example, the proper termination of the main output is shown in figure 3-6. Placing the 50Ω terminator, or 50Ω resistance, in parallel with a higher impedance matches the receiving instrument input impedance to the generator output impedance, thereby minimizing signal reflection or power loss on the line due to phase angle mismatch.

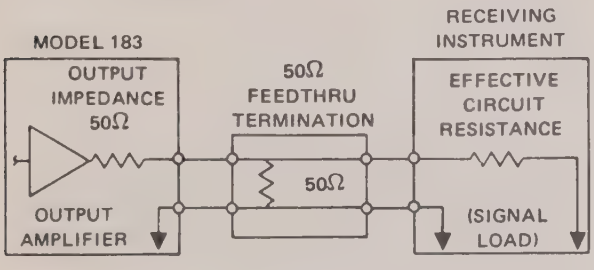


Figure 3-6. Signal Termination

The input and output impedance of the generator connectors are listed below:

Connector	Impedance
50Ω OUT	50Ω
TRIG IN	10 kΩ
PULSE OUT (TTL)	*
SWP OUT	600Ω
VCG IN	5 kΩ
GCV OUT	1 kΩ

*The PULSE OUT connector can drive up to 20 Transistor-Transistor Logic (TTL) loads (low level between 0V and 0.4V, and high level between 2.4V and 5V).

3.2.2 Continuous Operation

Basic, or continuous, operation of the generator involves turning on power, selecting a continuous output mode, selecting a waveform, and setting the output signal frequency and amplitude. When operation is critical, allow a one-half hour warm-up period. The following steps demonstrate use as a basic function generator:

Step	Control/Connector	Setting
1	50Ω OUT	Connect circuit (refer to paragraph 3.2.1).
2	PULSE OUT	Use for external synchronization, if required.
3	GEN MODE	CONT.
4	WAVEFORM	Choose one of the left-hand set of waveforms. If dc or dc offset is desired, use right-hand set.
5	SYMMETRY	NORMAL or desired asymmetry. (Affects frequency calibration.)
6	FREQ	As desired for frequency range.
7	Frequency Dial	As desired for exact frequency.
8	FREQ VERNIER	CAL, unless higher than normal frequency accuracy is required at a non-XCG frequency, in which case, monitor with a frequency counter.
9	AMPLITUDE	As desired.
10	AMPLITUDE VARIABLE	As desired (20 dB range).
11	DC OFFSET	As desired (step 4, right-hand set of waveforms must be chosen). CW positive offset, CCW negative offset. See figure 3-7 for restrictions.

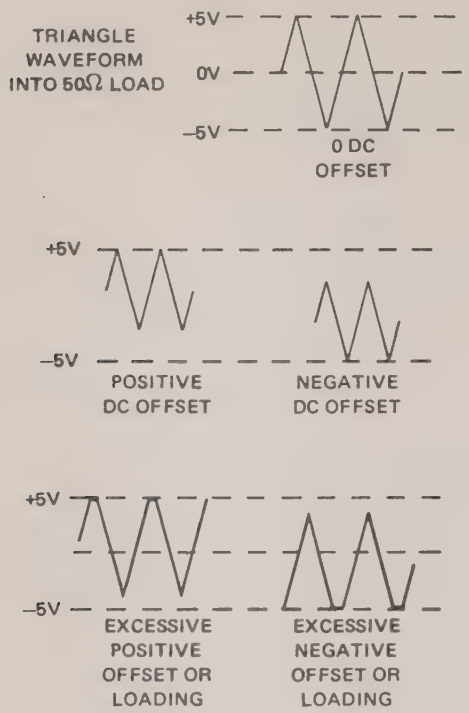


Figure 3-7. DC OFFSET Control

3.2.3 Trigger Mode

Operation as a triggered one cycle generator is as for a basic function generator, only the operating mode is triggered (TRIG) instead of continuous (CONT), and a manual or remote trigger (MAN TRIG, TRIG IN) is used to start the single cycle of waveform. Perform the steps given in paragraph 3.2.2, only set the GEN MODE control in step 3 to TRIG. Refer to paragraph 3.2.4 for triggering.

NOTE

The generator sweep circuit can be used as source of repetitive trigger inputs.

3.2.4 Triggering

Manual trigger as follows:

Step	Control/Connector	Setting
1	TRIG LEVEL	Full CCW.
2	MAN TRIG	Press for each cycle desired.

Remote trigger as follows:

Step	Control/Connector	Setting
1	TRIG LEVEL	Rotate the TRIG LEVEL control CW to set negative thresholds as low as –7.5V through which a positive-going TRIG IN connector input can pass to provide triggering. CCW sets positive thresholds of up to +7.5V through which a positive-going TRIG IN level can pass to provide triggering.
2	TRIG IN	Apply a positive-going voltage (through the threshold set in the preceding step) to the TRIG IN connector to provide remote triggering.

CAUTION

Avoid voltages greater than ±50V at TRIG IN to prevent damage to the generator.

3.2.5 GATED (or Tone Burst) Mode

Operation as a gated or tone burst generator is as for a triggered generator, only the operating mode is GATED, and releasing the MAN TRIG or removing the remote trigger voltage ends the burst of output waveform. Perform the steps of paragraph 3.2.2, only set the GEN MODE control to GATED. Refer to paragraph 3.2.4 for triggering.

3.2.6 SWEEP Mode

The generator can be set for a repetitive sweep of output frequencies within a given range. Operation is like continuous mode, only a separately controlled, internal ramp generator provides an additional VCG input to control frequency. (This internally-generated ramp is also available at the SWP OUT connector.) Perform the steps given in paragraph 3.2.2, only set the GEN MODE control in step 3 to SWEEP and include the following steps:

Step	Control/Connector	Setting
1	SWEEP MODE	SWEEP START.
2	Frequency Dial	Desired start sweep frequency.

Step	Control/Connector	Setting
3	SWEEP MODE	SWEEP STOP.
4	SWEEP WIDTH	Desired stop sweep frequency.
5	SWEEP MODE	CONT SWEEP.
6	SWEEP TIME	As desired.

NOTE

To monitor the ramp generator, use the SWEEP OUT connector. To monitor the frequency of the main generator, use the GCV OUT connector, which is a voltage proportional to the generator frequency.

Crystal control and sweep control may be used simultaneously, but it is not recommended. However, discrete frequency stepping does occur for XCG frequencies within the sweep range, provided the sweep time between each frequency does not exceed the lock time of the XCG circuit.

3.2.7 XCG Mode

XCG (crystal controlled generator) operation allows selected XCG frequencies to be locked to a crystal oscillator for greater accuracy. XCG frequencies correspond to each of the 25 dial marks in the X 10 thru X 1M ranges. Follow the steps in paragraph 3.2.2, except in step 3 set GEN MODE to XCG. In step 7, frequency selection, the XCG lamp will light when frequency locking occurs.

3.2.8 Voltage Control – VCG

Operation with voltage control can be done in any mode but is usually done in continuous mode; the frequency within a particular range is additionally controlled with dc levels within ±5V, injected at the VCG IN connector. Perform the steps given in paragraph 3.2.2, only set the frequency dial to determine a reference from which the frequency is to be voltage controlled.

1. For frequency control with positive dc inputs at VCG IN, set the dial for a lower limit from which frequency is to be increased.

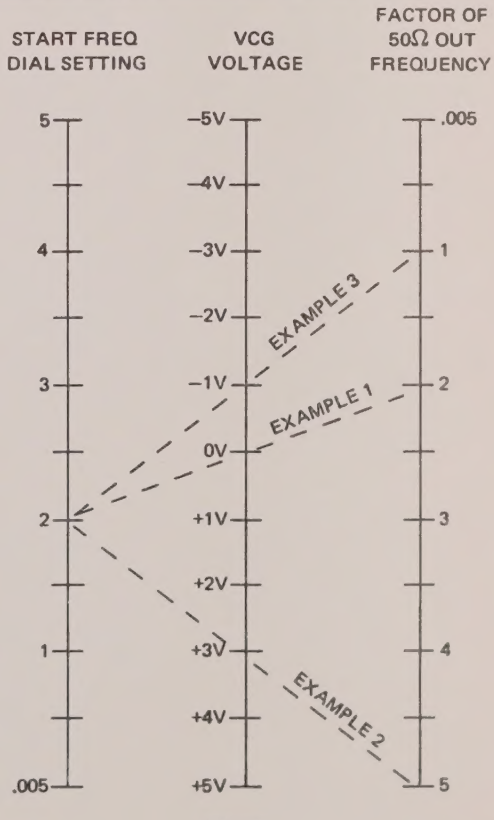
2. For frequency control with negative dc inputs at VCG IN, set the dial for an upper limit from which frequency is to be decreased.

3. For modulation with an ac input at VCG IN, center the dial about 2.5 on the linear scale.

NOTE

Crystal control and voltage control may be used simultaneously; however, ac excursions in this mode are not recommended.

Figure 3-8 is a nomograph with examples of the frequency dial effect as a reference for VCG IN voltages. Example 1 shows that with 0V VCG input (2nd column), frequency (3rd column) is as determined by the frequency dial setting of 2 (1st column). Example 2 shows that with a positive VCG input, output frequency is decreased. (Note that the Factor of 50Ω OUT Frequency column must be multiplied by the frequency range in order to give the actual 50Ω OUT frequency.) For full 1000:1 VCG sweep of the generator frequencies, set the FREQ VERNIER full CCW.



NOTE

The FREQ VERNIER must be rotated full CCW for 1000:1 range.

Figure 3-8. VCG Voltage-to-Frequency Nomograph

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